

A THEORETICAL STUDY OF X-RAY EMISSION LINES

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During the years covered by this report, we have updated our X-ray emission code and applied it to objects as diverse as cataclysmic variables, supernova remnants, the solar transition region, the galactic halo, and low-mass X-ray binaries.

We have also designed and written a new code to replace it, and we are in the process of evaluating atomic data, fitting it with the functional forms used in the code, and entering it into our data files. So far we have distributed only the predicted emissivities for the EUV lines of iron. We plan to provide the complete code in time for AXAF.

The most recent publication specifically dealing with atomic rates is the model of iron emission in a solar active region and an RS CVn star (Brickhouse, Raymond and Smith 1995). We used the relatively large numbers of reliable emission line intensities to evaluate the reliability of the most up-to-date calculations of collisional excitation rates for the relatively complicated ions Fe IX - Fe XXIV. We find that a 30% uncertainty level is appropriate, though some larger discrepancies occur.

We have also investigated the effects of non-Maxwellian electron velocity distributions on the ionization state and UV emission line intensities of the solar transition region and corona. The particular non-Maxwellian models we investigated do not reproduce observed spectra (Anderson, Raymond and van Ballegoijen 1995).

We have also written a review paper which describes a number of atomic processes which we generally left out of astrophysical emission line calculations. We give examples of circumstances where these processes are important (Raymond and Brickhouse 1995).

The following list covers refereed papers supported by this grant. A comparable number of presentations were made at conferences.

Supernova Remnant Shocks Close-Up, J.C. Raymond 1991, *PASP.*, **103**, 781.

Microflare Heating of the Galactic Corona, J.C. Raymond 1992, *Ap. J.*, **384**, 502.

On the Density Sensitivities of Dielectronic Recombination, D.B. Reisenfeld, J.C. Raymond, A.R. Young, and J. Kohl 1992, *Ap. J. Letters*, **389**, L37

Iron Ionization and Recombination Rates and Ionization Equilibrium, M. Arnaud and J. Raymond 1992, *Ap. J.*, **398**, 394.

Effects of Inclination Angle on the Spectra of X-ray Binaries, S.D. Vrtilek, N. Soker, and J.C. Raymond 1993, *Ap. J.*, **404**, 696

A Model of an X-ray Illuminated Accretion Disk and Corona, J.C. Raymond 1993, *Ap. J.*, **412**, 267

Atomic Processes in Astrophysics, J.C. Raymond & N.S. Brickhouse 1995, to appear in
“Laboratory, Solar and Stellar, Diffuse Astrophysical and Extragalactic Plasmas - a
volume honouring Sir Robert Wilson”, T.W. Hartquist & A.J. Willis, eds. (Kluwer)

